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# MEDICAL NEWS LETTER

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## Biological Warfare Medical Defense (Concluded)

### Medical Countermeasures in BW Detection and Identification of BW Agents

### Part II

In order to expedite rapid and early identification of Biological Warfare (BW) agents, the Navy Medical Department is establishing a BW Agent Detection and Identification Organization which is being developed along the following lines:

1. First Level Laboratories (the local shipboard or shorebased laboratory). To process samples for shipment to a second level laboratory and to gain time to analyze aliquots for tentative identification of the more easily recognized agents. Also, to determine drug and antibiotic sensitivity of agent if possible. (The extent of functioning will depend mainly upon local capability and, thus, will vary from activity to activity).
2. Second Level Laboratories (Preventive Medicine Units and certain medical research activities). To make tentative identification of those agents more difficult to recognize, and to confirm and complete identification of the more easily recognized agents. Also, to determine drug and antibiotic sensitivity if possible. To furnish trained epidemiological teams upon request.
3. Third Level Laboratories (U. S. Naval Medical Research Unit No. 1, Berkeley, Calif.). To confirm and complete identification of all agents not previously so done by a Second Level Laboratory.

Because analyzing samples requires time-consuming laboratory procedures, it has become necessary to establish certain guiding principles regarding the sampling and identification of BW agents in order to reduce the workload to a manageable level. The principles basically are as follows:

1. Collect best available samples. The best sample is the earliest available and purest sample and preferably should be collected from dud munitions, grossly contaminated articles, et cetera. If adequate aerosol samples and other nonclinical type samples are not available, clinical specimens may be the first available source of agent.
2. Medical personnel should screen samples for selection of those best for analysis. Optimal would be selection of a single sample per attack from which aliquots to be analyzed by the 1st and 2nd Level Detection and Identification (D and I) Laboratories could be prepared.

3. Medical personnel should process samples for forwarding to D and I Laboratories. Perhaps two aliquots per laboratory will be advantageous, one for culturing enroute and one for culturing after arrival.

4. When absolutely necessary to conserve food and water that cannot be routinely decontaminated, samples of food and water should be collected for forwarding to D and I Laboratories for analysis. Initial step in detecting contamination of food and water is identification of agent from the purest sample available which, for example, may be one collected from a dud munition. The most practical procedure which, however, is not a responsibility of the Medical Department, is to routinely dispose of, or decontaminate, potentially exposed food and water. (See BuSandA Instruction 3442.1 and 3442.3).

5. Detection of residual contamination of surfaces, living spaces, et cetera, is rarely indicated and then only if a persistent agent is involved. Routine decontamination by appropriate nonmedical personnel should be practiced whenever significant potential contamination is suspected.

At the present time, sampling equipment has not been standardized and a kit made specifically for this purpose cannot be procured through routine supply channels. A BW Sampling Kit has been developed for training purposes, but an improved model will be needed for operational use. As an interim measure, ships having medical officers regularly assigned have been furnished items of supply and equipment which will allow a limited capability for sampling. (See BuMed Instruction 6700.8, dated 10 June 1954). At the present time, it is recommended that samples be collected in sterile o.2% gelatin- 1.0% disodium phosphate (anhydrous) solution for transmission, without filtration or additional processing, to a second level Detection and Identification Laboratory (nearest Preventive Medicine Unit). Examination of samples by the local activities (first level laboratories) is encouraged if a sufficient amount of sampled material is available. The samples being transmitted to the second level laboratory should be packed in crushed ice in the Dewar flask. The flask should be encased in a wooden box for prevention of breakage; a loose-fitting wooden cover as a lid for the flask is also recommended. Transportation should be by air if that is the most rapid means of shipment available and accompanied by a courier. As the ice melts, it should be replenished by the courier. Appropriate data should be transmitted with the samples. Shore based establishments should follow the same procedures. A special allocation of materials has not been made to shore based facilities because necessary items, if not already available, can be easily obtained. Clinical specimens should be collected and transmitted according to standard methods.

Even with careful screening of samples, there will undoubtedly be a disparity between the workload thrust upon the Detection and Identification

Laboratories and the time and personnel available. Consequently, not only will adequate screening for the best samples be critical, but the various samples will have to be handled on a priority basis. Those samples collected for identification of the agent, whether collected from environmental sources, such as aerosols, dud munitions, et cetera, or from the first clinical cases, will be given the highest priority. Food and water samples will usually be given the next priority unless the samples were collected for identification of the agent rather than detection of an agent previously identified in other samples in which case the samples would receive the highest priority. Detection of residual environmental contamination will have the lowest priority.

Prophylaxis and Therapy. The most effective medical countermeasures in prophylaxis and therapy will involve the utilization of vaccines, drugs, and antibiotics. Vaccines will be most effective when they are utilized prior to exposure; however, they may be used to a limited extent after exposure, provided the agent is rapidly identified and the incubation period of the disease is sufficiently long. Occasionally, it may be possible, at least in selected personnel, to artificially prolong the incubation period by the administration of an appropriate drug or antibiotic. Vaccines will also be useful in the prevention of secondary cases if a self-propagating outbreak should develop. It should be realized that an effective vaccine may not be available and also that immunity may be more easily overcome when exposure is via the respiratory route.

Drugs and antibiotics will be used principally in early therapy rather than after exposure, but prior to onset of symptoms. If the action of the drug or antibiotic against the specific agent is suppressive rather than eradicative, the result will simply be to delay the onset of illness rather than to abort the disease unless an immunological response is also present to allow the host mechanisms to abort the disease. An immunological response usually occurs towards the latter part of the incubation period or early during the onset of clinical illness. Consequently, at the risk of over simplification, suppressive type drugs should not be given in most instances until clinical illness has developed. They should, however, be given as early as possible after symptoms have occurred. Eradicative type drugs and antibiotics (type of action depends upon both the type of chemotherapeutic agent as well as the BW agent involved) would be more likely to abort the disease if given early after exposure. However, except in small units, the logistic limitations would probably not allow prophylactic administration to all personnel believed to have been possibly exposed to an infectious dose of the BW agent. Early therapy would automatically restrict administration of chemotherapeutic agents to personnel exposed to an infectious dose. Early specific therapy would also minimize the duration of morbidity, the spreading of a self-propagating type epidemic and the case-fatality rate.

The critical importance of early identification of the agent and determination of its sensitivity to the various drugs and antibiotics is obvious.

The inherent limitations whenever a naturally or artificially drug and antibiotic resistant strain of agent is involved are also obvious. It is important to realize that in certain lethal type infections therapy must be instituted at the earliest possible moment if death is to be prevented. There is a "point of no return" past which drugs and antibiotics, otherwise highly effective, will not prevent death due to the toxic aspects of the infection. It is believed that in certain infections this "point of no return" may actually coincide with the appearance of symptoms.

Epidemiological Countermeasure. Mention should be made of the role of epidemiological countermeasures in BW defense since they will be of vital importance in the event a self-propagating type of BW outbreak should occur. Early institution of epidemiological countermeasures, such as isolation, quarantine, restriction of personnel movements, et cetera, should be initiated as soon as possible and strictly enforced. If the agent is determined not to be capable of producing a self-propagating epidemic, these restrictive countermeasures may be relaxed. A compromise in the immediate initiation of such restrictions may also be necessary because of overriding requirements of the military situation. Also, it should be pointed out that epidemiological countermeasures of the type mentioned here will be of limited, or no value, in preventing the initial casualties resulting from a primary aerosol of BW agent.

Decontamination of Casualties. A cardinal principle in decontamination of personnel is to prevent spread of contamination to clean areas and this is particularly important when treatment spaces are involved. Control of contamination after a BW attack is similar to that recommended for preventing the spread of contamination by CW agents which is discussed in NavMed P-5041 (Treatment of Chemical Warfare Casualties).

The Medical Department will not be responsible except in an advisory capacity for decontamination of the environment and of personnel who are not casualties. Casualties resulting from exposure to a BW agent will usually have been decontaminated prior to the onset of illness because of the delayed onset corresponding to the incubation period. Decontamination of wounded casualties will be accomplished by, or under, the close supervision of medical personnel.

Decontamination, if practical immediately after exposure, may result in the prevention of infection because of the time delay between exposure and initial reproduction of the agent. This delay may be minutes to hours and, provided the agent is not in an inaccessible area of the body, an attempt should be made to expedite decontamination procedures. If only minor wounds have occurred, the initial decontamination procedure will be one of self-aid. Because even minor abrasions are of significance in BW, an effort should be made to render medical attention as soon as the tactical situation permits.

Self-Aid and First-Aid. Showering with soap and water is the most important self-aid procedure for nonwounded personnel. A hexachlorophene

soap should be used if available. Any minor wounds, such as abrasions, should be treated with an antiseptic, such as tincture of iodine and covered to prevent further contamination. If the individual is a casualty, similar procedures for minor wounds would be accomplished by medical personnel or under their close supervision as a first-aid procedure. Penetrating or more extensive wounds, such as a laceration, would be decontaminated by simple irrigation with saline or water by medical personnel. Debridement is important and primary closure of the wound should be avoided. The wound should be covered to prevent further contamination.

Mass Casualty Handling. Mass casualty handling and evacuation will involve methods similar to those normally used except care will have to be exercised to prevent dissemination of contamination or spread of contagious infections. (Sp. W. Def. Div., BuMed)

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## Occupational Health on Farms

Health agencies have many as yet undischarged responsibilities toward rural Americans. To comprehend the responsibilities of official agencies for occupational health on farms, it is useful to grasp the extent of industrialization of American agriculture.

In 1910, there were 322 million acres of cropland. Today, there are 350 million acres of cropland—an increase of only 9%. Yet this acreage produces more than enough food for our expanded population. It is estimated that 310 million acres will supply the 1960 population, thanks to the increase in productivity per acre. Improved soil management, such as erosion control and the use of fertilizers and other agricultural chemicals, including pesticides and weedkillers, have contributed part of this gain. Power machinery has increased the farmer's capacity to plow, sow, harvest, and manage livestock. Furthermore, market crops now grow on about 75 million acres formerly used to grow feed for the horses and mules which have been replaced by power machines.

Mechanization has made it possible for farms to produce more than enough for our present needs through the efforts of only 6,500,000 farm workers, or 11% of our working population, whereas in 1910, 11,600,000, or 31%, were employed in agriculture.

The number of American farms, in 1954, was 5,425,000 as compared with about 6,600,000 in 1910. More important, half of our present farms produce nine-tenths of the crops. This concentration offers a striking parallel to many industries in which a small number of large companies account for a high percentage of the total production.

Even as large manufacturing concerns with large-scale operations tend to employ the latest advances in mechanization, so, and frequently to

a greater degree, large farms tend to employ mechanical equipment. The capital investment associated with many of the new mechanical farm devices often runs to a sum which is not economical for a single-family farm. Agricultural changes during the past generation, therefore, have come to create new working conditions even as industrialization changed working conditions in mines and mills.

How do these changes affect the health and safety of farm workers? Farming is intrinsically hazardous. Injuries have always been frequent on farms. Although statistical evidence is lacking, experience has shown that many injuries may be expected from the handling of farm horses. A limited survey in one county within the past 6 months showed that 8 out of 29 recent accidents were associated with horses.

Other farm animals also—particularly bulls—present hazards to farm hands. Injuries from the use of sharp or heavy tools or the stress of heavy lifting also are common farm afflictions, frequently resulting in chronic conditions, herniation, paraplegia, or impairment of vision.

The danger of infections from injuries incurred on the farm must be considered much greater than that in industry. This danger is heightened by the nature of the working environment, the inaccessibility of first-aid facilities, and the absence of interest in giving prompt care to minor wounds and other dermatological conditions. The prevalence of the tetanus hazard on farms is well recognized by physicians, but other organisms also must be considered.

A number of bacterial diseases are associated with agricultural work. Brucellosis, or undulant fever, is thought to be the most common one, but reliable statistics are lacking. It is not likely that all brucellosis is correctly diagnosed or that all diagnosed cases are reported. One factor contributing to the incidence of brucellosis is that rather than call upon a veterinarian, many farmers themselves vaccinate cattle and thereby risk accidental infection. Other diseases of significance on farms include anthrax, erysipeloid, leptospirosis, tularemia, bovine tuberculosis, and various forms of salmonellosis.

By occupation, the farmer is exposed also to viral and rickettsial diseases, including equine encephalomyelitis, psittacosis, Q fever, and Rocky Mountain spotted fever. There is a long list of mycotic diseases of which actinomycosis and histoplasmosis are examples. A number of parasitic diseases also are potential farm hazards.

Moving from these biological hazards to physical agents, it is found that farm work involves exposure to extremes of temperature, both high and low. Heat exhaustion and heat stroke undoubtedly affect many farm workers. Another condition of possible significance is skin cancer, produced by prolonged exposure to the sun's rays.

The increased use of machines has brought a whole group of hazards new to agriculture. Noise exposures, for example, may now be sufficient

to affect the hearing of farmhands who operate machines for extended periods. When more is learned about the problem of vibration, this also may be found to have adverse health effects on agricultural workers. Maintenance and repair work on farm machinery introduce hazards associated with welding.

Accidents incurred in the use of farm machinery represent one of the major categories of farm hazards. Accident rates in agriculture are far above industry as a whole. In 1954, only the mining and construction industries had higher death rates: Agriculture had 60 fatal work accidents per 100,000 (a total of 3800) as compared with a rate of 25 per 100,000 for all industries. The injury rate, according to the National Safety Council, was 4930 per 100,000 as compared with 3240 per 100,000 for all industries.

In addition to biological and physical hazards, the industrial hygienist who looks at present-day farming is struck forcibly by the number of toxic chemicals in use. Although many are soil conditioners and fertilizers involving little hazard, the majority are insecticides, fungicides, rodenticides, nematocides, and weedkillers which are employed specifically because of their toxic properties. While some are comparatively safe, nearly all present some degree of danger, and some must be classified as extremely hazardous. In particular, the heavy metals, such as lead, arsenic, and mercury, the halogenated hydrocarbons, and the organic phosphates present serious potential dangers to the people using them and sometimes to others working or living in the vicinity.

In dealing with industrial exposure to hazardous materials, the view is frequently expressed that any material, regardless of toxicity, can be used safely provided that proper control measures are employed. The same philosophy might be applied to agriculture, but assurance of proper control measures is harder to obtain, at least at the present time. The reasons are apparent. Industrial operations are usually performed in a fixed location where exhaust ventilation or other suitable control methods are feasible. Industry has been subjected to fairly extensive and intensive educational programs on health and safety for at least a generation. Large companies usually have full-time safety and medical departments which are alert to potential dangers. Furthermore, personnel of insurance carriers and official agencies make frequent visits to industrial plants to check for possible hazards.

On the other hand, agricultural workers generally have little idea of the hazards of handling and applying powerful chemicals. Although most chemicals of this type carry warnings on the container labels, the tendency is to pay little or no attention to the labels, particularly if a material has been used previously without untoward incident.

Moreover, the methods of application are almost as varied as the materials used. Many of these methods present dangers that would not be tolerated in manufacturing establishments. For example, the application of fumigants, such as carbon tetrachloride in connection with grain storage may employ techniques that would horrify an industrial hygienist.

While rural health services can use all available community resources, occupational health personnel must not overlook their special responsibility. Industrial hygienists, in checking the working environment in factories and mines, are also concerned with the water supply, washing facilities, waste disposal, and food sanitation. Nor should they neglect these points with respect to farm work or, for that matter, in other situations where rural workers are housed temporarily, as in construction camps. Because such responsibilities also rest upon other personnel in State and local health agencies, policies for the best utilization of available manhours must be developed to meet the individual situation. It is important, however, to recognize the place of environmental and medical care services in the occupational conditions of agricultural workers.

The subjects which need exploration are numerous. Study needs to be made of the toxicology and proper application of chemicals, of the safe use of mechanized equipment, of the general health status of agricultural workers as compared with the rest of the population, of the effectiveness of educational measures, and of the availability of health resources.

This is a new and complex field confronting the industrial hygienist. Occupational health needs on the farm may not be readily anticipated, but in every State where agriculture is a significant industry, an earnest beginning should be made to meet this public health responsibility. (Doyle, H. N., Occupational Health on Farms: Pub. Health Rep., 72: 145-148, February 1957)

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## The Human Leptospiroses

Within recent years, rapid advances have been made in the knowledge of the leptospiroses. The increasing number of publications dealing with this subject is proof of the greater awareness of the importance of leptospiral infections.

This review draws attention to this group of microorganisms and the great variety of disease processes caused by them. The history of leptospirosis dates back to the careful description of the clinical findings and the course of the disease by Weil in 1886. Roughly 30 years later, the etiological agent of this syndrome was discovered by Inada and his coworkers in Japan and independently by Uhlenhuth and Fromme in Germany. The name Leptospira icterohaemorrhagiae was given to this "spirochaete" by Noguchi and has been retained as the valid genus name. Almost another 20 years elapsed before it was realized that the L. icterohaemorrhagiae was not the only species or type responsible for disease in man and animals. The name Leptospira canicola was given to a strain which was first isolated from dogs by Klarenbeek and Schuffner, in 1931, and found to differ

serologically from L. icterohaemorrhagiae. One year later, Dhont et al., reported that canine infections with L. canicola were very common in Holland and that, although in dogs with jaundice, L. icterohaemorrhagiae could be demonstrated in almost 100% of the cases, L. canicola was the organism responsible in the majority of instances (90%) in which the azotemic-uremic syndrome was found. These authors also showed that L. canicola on first passage from dogs to the guinea pig rarely caused overt disease in this animal in contrast to L. icterohaemorrhagiae. Schuffner, in the same year, observed the first human infections with L. canicola which presented a clinically similar, although milder, form of Weil's disease. From this time on, in rather quick succession numerous other leptospiral strains were isolated from man and many animal species and have been found responsible for a variety of clinical disease processes in man.

Clinical Disease Forms in Man. The salient features as they have merged from observations over the past years are summarized with particular emphasis on the great variability in the clinical response to infections by leptospirae.

Various attempts have been made to divide the human leptospiroses on the basis of their clinical manifestations, the geographic location, or the specific leptospiral strain involved. Gsell's division into "malignant" and "benign" or Beeson's into "icteric" and "anicteric" forms, although very general, is probably most appropriate. In both classifications, the "malignant" or "icteric" is identical with the clinical features of severe classical Weil's disease, whereas, the "benign" or "anicteric" form represents a variety of clinical manifestations, such as mild Weil's disease without jaundice, pure meningeal forms under the picture of "aseptic meningitis," short febrile illnesses known as "mud fever," "seven-day fever," "field fever," "cane," or "rice field" fever, and a number of other names with or without meningeal involvement, such forms as "Fort Bragg fever" and even symptomless infections.

Weil's Disease. The incubation period may vary from 2 to 20 days with an average of 7 to 14 days in most recorded cases. The onset is sudden with high temperatures, headaches, chilly sensation, and severe muscle pain, particularly of the calf muscles. Anorexia, vomiting, and abdominal pain are present in many patients. Petechial hemorrhages are common and nosebleed, melena, and hematuria may occur. Prostration is marked and "conjunctivitis" is almost invariably noted. The first signs and symptoms of renal affection start in the latter part of this first or septicemia stage which lasts from 3 to 7 days and is terminated by a lytic fall in temperature. Leptospirae are present in the blood only during this phase and can be demonstrated by culture, animal inoculation, or more rarely, by dark-field.

The second or hepatic stage is characterized by involvement of the liver. Overt jaundice develops only in a certain percentage of cases, but even in those patients who do not show icterus, tenderness and some

enlargement of the liver are usually present, Varying degrees of impairment of liver function, as determined by laboratory tests, can be demonstrated.

The third or convalescence stage is always protracted and about 20 to 25% of patient's relapses occur between the third and fifth week of the disease. These are usually brief and without consequences. However, sequelae in the form of iritis, iridocyclitis and optic neuritis have been reported. The central nervous system is frequently affected during the course of the disease, but the true incidence of meningeal involvement is not known. Leptospirae have been isolated from the spinal fluid of patients with nuchal rigidity and headache, but without increased cell count. Other clinical observations include skin rashes, alopecia, and enlargement of lymph nodes indicating the extreme variations in the clinical manifestation.

Canicola Fever or Leptospirosis Canicolaris. These two terms are used interchangeably to denote infections caused by L. canicola. Since the original separation of L. canicola from L. icterohaemorrhagiae, numerous reports have appeared in the literature describing sporadic and epidemic infections due to L. canicola in man. Rosenberg, in a comprehensive review of canicola fever, presents a list of the frequency of the various manifestations encountered in the reported cases. He stresses the following points as of importance in differentiating canicola fever from Weil's disease: "a larger number of female patients, a much lower incidence of jaundice, a higher frequency of meningeal signs and febrile relapses, and a much milder illness."

In addition to causing a Weil-like syndrome, L. canicola is an important etiological agent of "serous or aseptic meningitis" and of acute febrile illnesses. These forms give rise to serious differential diagnostic problems that can be solved satisfactorily only by adequate laboratory investigations, provided leptospirosis is at all thought of. Most workers interested in this field—in human as well as veterinary medicine—believe these infections to be more common than realized.

A similar or identical situation prevails with respect to infections by L. pomona. This sero-type was originally isolated by Clayton et al., in Australia from a patient suffering from a mild febrile disease and represented the first indication of a benign form of leptospirosis existing in Queensland. During the intervening years, L. pomona infections in man have been recognized in various countries. This organism causes an influenza-like disease with signs and symptoms of "aseptic meningitis." According to most reports, the chief clinical features are: acute onset with high fever, sometimes of a biphasic type, severe headaches, stiffness of neck, photophobia, myalgia, and transient skin rashes. The cerebrospinal fluid pressure is slightly increased and during the second week of the disease, pleocytosis (mainly lymphocytes) is regularly found. The proteins are usually elevated, but chloride and glucose levels are normal. These findings are by no means characteristic for L. pomona infections, but have also been obtained in

infections with other leptospiral sero-types (L. mitis, L. sejroc, L. Hebdomadis, and others). Clinically, the correct diagnosis is rarely made—at least initially. A number of viral infections, such as mumps meningitis, lymphocytic chorio-meningitis, early stages of poliomyelitis, Coxsackie and herpes infections, and even incipient tuberculous meningitis are differential diagnostic alternatives and more often considered than leptospirosis.

Another clinical entity due to leptospirae has been known and described under the names of "mud fever," "cane-cutter's fever," "rice field fever," and other local terms. This form of infection is caused chiefly by L. grippotyphosa in central and western Europe and by related sero-types in the Far East. The clinical signs and symptoms resemble those of influenza or other vague "febrile" diseases. Characteristically, it occurs in epidemic outbreaks, but sporadic cases have been reported. The disease is, in most instances, mild and self-limiting and while little diagnostic difficulty is encountered in the seasonal epidemic outbreaks, many sporadic cases probably go undiagnosed.

The identification of the etiological agent of "Fort Bragg fever" as a leptospira by Gochenour, et al., bears witness to the great versatility of this group of organisms and suggests the possibility of leptospirae as etiological forms.

All available evidence indicates that, at present, there is no antibiotic of choice available for the treatment of leptospirosis. Nevertheless, penicillin in high doses given as early as possible in the disease appears to shorten the course and lessen the severity of the illness. Some authors find Aureomycin more satisfactory, but this opinion is based on a small number of cases. Goldberg recently introduced a technique of antibiotic sensitivity testing for leptospirae that should provide a useful screening method for the selection of the most active antibiotic. The loss of motility of the leptospirae is the criterion of effectiveness of an agent and the test can be read within 6 hours. Whether a direct correlation between the in vitro sensitivity and the in vivo efficacy is possible, only future experience will show. (Reed, R.W., Kalz, G., The Human Leptospiroses: Am. J. Med. Sci., 233: 320-330, March 1957)

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## Novobiocin Therapy of Pyogenic Infections

Novobiocin is a new antibiotic isolated from cultures of Streptomyces species which was independently discovered in the research laboratories of three pharmaceutical companies and marketed by two of them under the names, albamycin and cathomycin.

This article is a report of bacteriologic and clinical studies of the albamycin preparation of novobiocin in 106 hospitalized patients with a variety of pyogenic surgical infections. Most were adults, but 12 were between the ages of 1 week and 7 years. Cultures of exudate were taken whenever possible before, and at intervals, during treatment and subcultures were tested (agar plate--medicated disc method) simultaneously to novobiocin and the older antibiotics. Sensitivity tests also were made on 100 strains of staphylococci isolated from the nares of 134 hospitalized patients. Also, studies of the binding effect of serum were made on in vitro sensitivities of staphylococci. In the clinical trials, the monosodium salt of novobiocin supplied in 250 mgm. capsules was used in adults and the pediatric dosage form (100 mgm. per 5 cc. of syrup) in infants and young children. In a few instances, the authors administered 500 mgm. of novobiocin by the intravenous route for one or more doses without apparent ill effects.

These studies reaffirm that novobiocin possesses a high degree of activity against staphylococci isolated from hospitalized patients. All but 3 of 216 strains of the strains tested were susceptible in vitro to this antibiotic; the 3 resistant strains were recovered from patients without previous contact with novobiocin, suggesting that native strains which are resistant to it do exist. Emergence of novobiocin-resistant staphylococci in two unhealed chronic infections was noted and similar observations have been reported by Kirby and associates and by Nichols and Finland. According to prevailing opinion, the emergence of resistant staphylococci parallels the frequency with which antibiotics are employed. The authors are concerned lest the unrestricted use of novobiocin should eventually follow the same pattern of older antibiotics. Penicillin and tetracylcine, the two most widely used systemic, and bacitracin, the most widely used local, antibiotic on the surgical wards and in the military dispensaries served by the hospital, are now among the least uniformly effective anti-staphylococcal drugs. The authors noted no therapeutic advantages accruing from the high serum concentrations of novobiocin which attend the administration of 1 gm. or more daily to adults and assumed that the 5 to 10 times higher concentrations of this drug required to inhibit growth of staphylococci in serum as compared to serum-free media nullify this advantage.

In addition to the potentialities of emergence of resistant staphylococci in novobiocin-treated patients, another factor which indicates the need for special care in the selection of patients for novobiocin therapy is the occurrence of allergic dermatitis in some patients requiring a course of novobiocin therapy for more than 6 days. The incidence of these reactions in this series of cases is in contrast to that reported by Welch who noted only one rash in 208 volunteers given 1gm. of novobiocin for 12 days and that of Rutenburg and associates who reported no reactions attending clinical trials of the cathomycin form of novobiocin in 90 surgical patients.

Results in 106 patients with various clinical infections were favorable in 74% of the cases and the nature of the responses was comparable to that obtained with the older antibiotics. In two indolent staphylococcal infections in which healing did not occur, emergence of novobiocin-resistant organisms was observed. The impression was gained that the resolution of novobiocin treated hemolytic streptococcal infections was no more rapid than with the older antibiotics. The reservation of novobiocin for use solely in staphylococcal infections due to organisms resistant to other antibiotics seems warranted. (Pulaski, E. J., Isokane, R. K., Novobiocin Therapy of Pyogenic Surgical Infections: Surg. Gynec. & Obst., 104: 310-318, March 1957)

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## Office of Naval Research Clinical Program

The Office of Naval Research supports clinical research in universities and nonprofit organizations. Funds in excess of $300,000 have been allocated to the following list of active projects:

| Investigator | Institution | Title |
|---|---|---|
| M. M. Strumia | Bryn Mawr Hospital | Preservation of Dried Plasma and Homologous Serum Hepatitis Virus |
| H. Montgomery | Univ. of Penna. | Physiologic and Pathologic Study of Experimental Immersion Foot |
| W. Andrew | Bowman Gray School of Medicine | Proliferation of Lymphocytes in the Epidermis |
| J. U. Schlegel | Univ. of Rochester | Post-traumatic Retention of Sodium |
| H. T. Meryman | Yale Univ. | Preservation of Whole Blood by Rapid Freezing and Thawing |
| R. B. Pennell | Protein Foundation | Glycerol Preservation of Red Blood Cells |
| A. D. Smith | Columbia Univ. | Study of Matrix Replacement in Bone |

| Investigator | Institution | Title |
|---|---|---|
| G. S. Mirick | Johns Hopkins Univ. | Studies on Infectious Hepatitis |
| A. A. Siebens | New York State Univ. | Abnormal Distention Following Unilateral Pulmonary Resection |
| S. Warren | Deaconess Hospital, Boston, Mass. | Use of the Color-Translating Microscope in Biologic Research |
| P. C. Hodges | Univ. of Chicago | Fast Camera for All-Purpose Photofluorography |
| W. F. Caveness | Columbia Univ. | Combat Head Injury, Follow-Up Study |
| R. F. Hagerty | Medical College of S. Carolina | Preservation of Living Human Homologous Cartilage |
| S. M. Mellinkoff | U. C. L. A. | Amino Acid Tolerance in Liver Disease |
| N. G. Georgiade | Duke Univ. | Preservation of Human Skin |
| M. A. Hayes | Yale Univ. | Endocrinologic Response to Metabolic Trauma |
| G. W. H. Schepers | Saranac Laboratory | Experimental Pulmonary Emphysema |
| A. A. Liebow | Yale Univ. | Pulmonary Anatomy, Pathology and Treatment of Anomalies and Injuries |
| W. Stone, Jr. | Massachusetts Eye and Ear Infirmary | Development of a Plastic Artificial Cornea |
| H. B. Shumacker | Univ. of Indiana | Function and Morphology of Blood Vessels and their Repair |

| Investigator | Institution | Title |
|---|---|---|
| R. K. Snyderman | Sloan-Kettering Institute | Clinical Evaluation of Freeze-dried Tissues |
| I. R. Telford and L. E. Church | George Washington Univ. | Studies of Normal and Abnormal Bone Development |
| J. F. Kell | Medical College of Virginia | Experimental and Clinical Investigation of Cerebral Regulation of Autonomic Nervous Function |
| J. M. Converse and B. O. Rogers | New York Univ. | Evaluation of Bovine Embryo Skin as a Biologic Dressing for Burns |

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## Program on Military Medicine at AMA Scientific Assembly

Information received from Captain C. L. Andrews MC USN, Secretary of the Section on Military Medicine of the AMA's Scientific Assembly, indicates that the officers of that Section have completed arrangements for a most stimulating, professional program and outstanding exhibits to be presented in New York City at the time of the annual meeting of the American Medical Association, 3-7 June 1957.

Speakers and discussants listed on the program include many prominent military and civilian physicians and scientists. The wide variety of timely and interesting topics to be presented and discussed should lead to an unprecedented attendance by active duty and Reserve medical officers as well as interested members of the civilian profession.

The meetings of the Section on Military Medicine will be held in the Coliseum located at Columbus Circle in New York City during the afternoons of 4, 5, and 6 June 1957. The Coliseum will be the focal point for most Sectional meetings and for exhibits, with the exception of a few Sections scheduled to meet in hotels within walking distance of the Coliseum.

Retirement point credits will be awarded for daily attendance of eligible Naval Reserve medical officers who register such attendance with the authorized military representative detailed to the meetings for this purpose.

The officers of the Section are:

Chairman . . . . . Colonel Russel V. Lee, USAFR(MC) (Inactive)
Vice Chairman . . . Major General Silas B. Hays, MC USA
Secretary . . . . . Captain Cecil L. Andrews, MC USN
Delegate . . . . . Colonel Charles L. Leedham, MC USA (Ret.)
Representative to
Scientific Exhibit . Colonel Frank M. Townsend, MC USA
Past Chairman . . . Major General I. S. Ravdin, MC USA (Ret.)
Past Chairman . . . Rear Admiral H. Lamont Pugh, MC USN (Ret.)

It is hoped that all military doctors (active and Reserve) will register with the Section and attend as many sessions as possible. Among the exhibits to be shown under the cognizance of the Military Medicine Section are:

Acute Respiratory Illness of Adenovirus (RI-APC) Etiology in Military Populations

Disease Free Laboratory Animals

Newer Approaches to the Study of Liver Diseases

Pediatric Diagnostic Clinic

Psychiatry in the U. S. Navy's Operation Deep Freeze

Clinical Diagnostic Studies Utilizing Radioactive Isotopes

Present Day Method of Moving Poliomyelitis Patients

Eye Protection Against Minute High Speed Missiles

U. S. Air Force Occupational Health Program

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## New Edition of Division Officer's Guide

The standard handbook for junior officers on personal leadership of enlisted men, the Division Officer's Guide, has just been published in a new revised and enlarged edition by the U. S. Naval Institute.

Nearly double the size of the first edition, the new book reflects the increasing complexity of the Navy and of the division officer's vital place in the triple chain of command responsibilities, technological requirements, and human relations.

This second edition distills the considered experience and judgment of an officer who has been a division officer and who now rewrites his instructions after having had the opportunity of leading and training other division officers. The new edition replaces obsolete materials with the latest word from the cognizant officers and offices of the Navy Department.

The handbook may be purchased from the U. S. Naval Institute, Annapolis, Md., at a cost of $2.00 per copy.

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## Food Service Training Program

Applications are desired from Lieutenants and Lieutenants (junior grade), Medical Service Corps, USN (Supply and Administration) for a two year course of instruction in Food Service Management, Cornell University. A limited number of training billets in this out-service course remain for the class which convenes in September 1957. Applicants should possess a sincere motivation for future duties in the Food Service Division of a Naval Hospital. Further, upon completion of this training, officers can expect to continue in such assignments at least through the grade of Lieutenant Commander. Arrangements with the University for attendance of selected candidates will be made by the Bureau.

Applicants will include the following statement in their request: "If this request is approved, I agree to remain on active duty for a minimum of three (3) years after completion of this course of instruction". Requests should reach the Bureau of Medicine and Surgery no later than 1 June 1957. (MSC Div., BuMed)

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## From the Note Book

1. Rear Admiral B. E. Bradley, MC USN, Deputy and Assistant Chief of the Bureau of Medicine and Surgery, represented the Surgeon General of the Navy at dedication ceremonies of the Ireland Army Hospital, U. S. Army Armor Center, Fort Knox, Ky. (TIO BuMed)

2. Captain W. C. Livingood, MC USN, recently elected to Fellowship in the American College of Surgeons, has been elected as National President of the Society of Military Otolaryngologists.

3. Lt. W. E. Crisp, MC USNR, Medical Reserve Company 4-13, Columbus, Ohio attended the First Asiatic Congress of Obstetrics and Gynecology held at Tokyo, Japan, as a guest speaker under the sponsorship of The World Medical Association.

4. The successful completion of a correspondence course is essential to promotion for inactive Reserve Medical Department officers and provides a means of accumulating retirement point credits. Specific courses for promotion of inactive Reserve Medical Department officers are not required. However, eligible officers may earn credits by completing any correspondence course administered by the Bureau of Naval Personnel. Inactive Reserve Medical Department personnel interested in earning promotion and retirement credit points may obtain information as to courses available, methods of submission of request for course, retirement and/or promotion points assigned each course by contacting the Medical Reserve Program Officers of their respective Naval Districts. (TIO, BuMed)

5. The following lantern slide sets have been completed and are now available on a loan basis from the Armed Forces Institute of Pathology:

1. "Correlated Cytology, Exfoliated Cells in Tissue Section," advanced set with descriptive booklet consisting of 100 color 2" x 2" slides.
2. "Benign and Malignant Lesions of the Small Bowel and Pancreas," (Radiology - teaching set) consisting of 93 2" x 2" x-rays.
3. "Pathology of Rheumatic Diseases," teaching set with booklet consisting of 100 color 2" x 2" slides. (Only two sets are available for loan) (AFIP)

6. A recent study by the National Bureau of Standards shows that radiation exposure resulting from an atomic blast can be estimated from the fogging of ordinary photographic and dental X-ray film. A convenient means is thus provided for reconstructing, at least approximately, the pattern of radiation distribution over different sections of a community in the event of such a disaster. (NBS)

7. A study of 240 patients with bleeding tendencies shows that 101 suffered from primary or congenital disease. The study summarizes clinical symptomatology and evaluates a battery of test procedures which allowed classification of the patients into the following groups: congenital vascular purpura; congenital platelet purpura and congenital plasma purpura. (J. Lab. and Clin. Med., February 1957; J.H. Lewis, M.D., et al)

8. Potential health hazards have been created through the escape of radium salts from their sealed containers. Simple tests for leakage of sealed radium sources are described. Methods of handling radium accidents of this type are outlined. Practical techniques of handling contaminated individuals, contaminated areas and equipment, and decontamination techniques are detailed. (Am. J. Roentgenol, March 1957; R.G. Gallaghar, E.L. Saenger)

9. Myoglobinuria is a sign of severe injury to a significant mass of striated muscular tissue. Aside from the traumatic varieties, there have been reported 28 cases of paroxysmal myoglobinuria. Seven of these have been associated with a recognizable form of muscular disease and 21 are idiopathic. (Arch. Int. Med., March 1957; C. M. Pearson, M. D., W. S. Beck, M. D., W. H. Blahd, M. D.)

10. The indications for surgical intervention in regional ileitis are discussed in Arch. Surg. March 1957; B. B. Crohn, M. D.

11. The effects of bed rest and of physical activity on recovery from tuberculosis were compared. Adult women with moderately far advanced or far advanced relatively fresh pulmonary tuberculosis were subjected to alternating periods of bed rest and of supervised physical activity while under treatment with combined chemotherapy. Detailed clinical and laboratory observations revealed no detectable deleterious effect of physical activity on the course of recovery. (Am. Rev. Tuberc., March 1957; J. G. Hirsch, et al.)

12. The current status of blood vessel replacement is discussed in Surg. Gynec. and Obst., February 1957; R. A. Deterling, Jr., M. D.

13. Contact and air-borne transmission of infectious agents is discussed in Am. J. Med. Sci., March 1957; J. E. Gordon, M. D., T. H. Ingalls, M. D.

14. A symposium on the asthmatic child appears in J. Dis. Chil., March 1957.

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BUMED INSTRUCTION 11240.2 7 March 1957

From: Chief, Bureau of Medicine and Surgery
To: Activities Under the Management Control and Financial Responsibility of BUMED

Subj: Annual review of requirements for ambulances and special medical and non-passenger carrying vehicles; construction equipment; and fire fighting, utility, and materials handling equipment

Ref: (a) Appendices A and B, Technical Publication NAVDOCKS TP-Tr-1 of 15 Jun 1953
(b) BUMEDINST 10490.1 of 14 Aug 1952, Subj: Materials handling equipment; maintenance and replacement standards for

This instruction implements the Annual Allowance and Requirements Review procedures promulgated by SECNAV Instruction 11240.13 in order to ascertain replacement and augmentation requirements for subject vehicles and equipment for use in planning and preparation of the Bureau of Medicine and Surgery Annual Budget Estimates. This data is necessary to assist the Bureau in support of its position during budgetary hearings.

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BUMED INSTRUCTION 5100.1A 7 March 1957

From: Chief, Bureau of Medicine and Surgery
To: Ships and Stations Having Medical/Dental Personnel

Subj: Recommended safe practice for hospital operating rooms

Ref: (a) BUMEDINST 5101.1A of 4 Feb 1957
(b) BUMEDINST 6700.6 of 14 Apr 1954 (NOTAL)
(c) BUSHIPSINST 9140.6 of 3 Sep 1954 (NOTAL)
(d) BUSANDAINST 5604.1 of 4 Jun 1956

Encl: (1) NAVMED P-5040 (1956) - Recommended Safe Practice for Hospital Operating Rooms - National Fire Protection Association - NFPA No. 56

This instruction directs attention to ignition hazards of flammable mixtures of combustible anesthetic agents, and to measures applicable in reduction and control of these hazards, as indicated in enclosure (1). BUMED Instruction 5100.1 is canceled.

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BUMED NOTICE 6150 28 March 1957

From: Chief, Bureau of Medicine and Surgery
To: Ships and Stations Having Medical/Dental Personnel

Subj: Standard Form 603 - Dental Record; custody and transfer of

Ref: (a) Art. 6-66(4) MANMED
(b) Art. 16-18(1) MANMED

This notice directs attention to the provisions of references (a) and (b) which concern the custody and transfer of the Standard Form 603 Dental Record.

# DENTAL SECTION

## Your Career in the U. S. Navy Dental Corps

The new booklet, Your Career in the U. S. Navy Dental Corps, (NavPers 35350) has recently been received from the printer and is ready for distribution. This booklet is intended to give information about Navy dentistry and to help evaluate a proposal for a career in the Navy Dental Corps. Initial distribution will be made to all Naval Districts and River Commands for dissemination to Naval Reserve Dental activities, to civilian dental schools, and to Officers of Naval Officer Procurement. All Navy Dental officers on active duty will receive this publication.

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## Navy Guide for Retired and Fleet Reserve Personnel

The Navy Guide for Retired and Fleet Reserve Personnel, NavPers 15891, provides a reference of many rights, benefits, and privileges to which retired and Fleet Reserve members and dependents may be entitled.

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## Central Needle Sterilization

An article, Central Needle Sterilization, published in the January-February 1957 issue of the Medical Technicians Bulletin, is of special interest to all dental personnel. This article summarizes a method for the sterilization of injection needles to prevent infections that may be transmitted as a result of improper sterilization techniques. CDR I. W. Ogden DC USN is the author of the article

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## Captain Schlack Elected to Membership in New York Academy of Sciences

Captain C. A. Schlack DC USN, Director, Dental Department, Naval Administrative Command, U. S. Naval Training Center, San Diego, Calif., was elected recently to membership in the New York Academy of Sciences.

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## Rear Admiral Riebe Retires

Rear Admiral H. P. Riebe DC USN, Inspector General of the Dental Department, retired on 1 April 1957. Admiral Riebe has completed a distinguished career of more than 30 years' service. His performance of duty in his many assignments is considered "outstanding." All that he has contributed has been of manifest benefit not only to the Dental Department, but to the Medical Department and the Navy as a whole. Rear Admiral R. W. Taylor DC USN has relieved Admiral Riebe as the Inspector General, Dental.

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## Treatment of Traumatic Injuries

Captain J. V. Niiranen DC USN, Naval Dental School, NNMC, Bethesda, Md., presented a demonstration on Treatment of Traumatic Injuries before a closed circuit color television camera at the Greater Philadelphia Annual Dental Meeting, Philadelphia, March 26 - 29, 1957.

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## Dental Officers Selected for Long Courses of Instruction

The Dental Training Committee, Dental Division, Bureau of Medicine and Surgery, has selected thirty-two Navy Dental officers for the post-graduate, residency, and advanced training during fiscal year 1958.

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Please forward requests for change of address for the News Letter to: Commanding Officer, U. S. Naval Medical School, National Naval Medical Center, Bethesda 14, Md., giving full name, rank, corps, and old and new addresses.

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# RESERVE SECTION

## Combat and Field Medicine Practice
## NavPers 10706-A

The Medical Department correspondence course, Combat and Field Medicine Practice, NavPers 10706-A, is now available for distribution to eligible regular and reserve officer and enlisted personnel of the Armed Forces. Applications for this course should be submitted on Form NavPers 992 (Rev 2-56) and forwarded via appropriate official channels to the Commanding Officer, U. S. Naval Medical School, National Naval Medical Center, Bethesda 14, Md.

Survival is one of the fundamental questions in military combat. Who will survive—you or the enemy? Will the attacking plane get through to your ship? Will your ship evade the submarines? If personnel suffer injuries, will they survive? If you are injured, will you?

The whole effort of the Medical Department achieves its ultimate purpose in medical practice during combat. Normally, naval medical practice is concerned with keeping personnel in top condition so they can move into combat at a moment's notice and withstand any strain. But during combat, the medical purpose becomes one of helping the wounded to survive so they can again man their stations. It is for this end that the Department basically exists. But medical practice in combat—whether afloat or ashore—raises many complex problems which tax to the utmost the abilities of departmental personnel.

Essentially, the functions of the medical and dental services in combat are two-fold in character—military and medical. These functions are performed under conditions which rarely permit the complete separation of one type of function from the other. Owing to their complexity, combat conditions demand the highest type of leadership and organization. Therefore, a knowledge of combat functions is absolutely indispensable to the execution of the mission of the medical and dental services in satisfying the demands both of patient welfare and the tactical situation.

Combat conditions are always unpredictable and it is unrealistic to try to prepare a routine of procedures for use in an unknown situation. Nevertheless, it is possible to learn a set of principles which are relevant to the problem and to see how they may be applied under varying circumstances. Medical Department personnel will then come to realize that under combat conditions every application of a principle must be made on its own merit, in the light of local circumstances, and with every consideration for military requirements.

Such is the purpose of the course in Combat and Field Medicine Practice. It provides personnel with a set of principles and flexible formulae which can be applied to varying situations. It enables them to perform their combat functions much more effectively with the concomitant result of a great improvement in their own outlook for survival.

The material presented in the various discussions of the course relates to the management of battle casualties in combat areas, traumatic shock, medical aspects of tropical warfare, and the medical aspects of warfare in extremely cold climates. Prevention and control of disease along with other professional practices are predicated on the latest opinions and research, and on the combined experiences of the Armed Forces and other authoritative sources. The material is not to be considered as complete or final, yet is it believed that in the aggregate the doctrines and procedures described will be found valid and helpful.

This course consists of four objective question type assignments and is evaluated at sixteen (16) Naval Reserve promotion and nondisability retirement points, and is designated as a course that may be retaken for point credit inasmuch as it is based upon completely new and revised texts, Combat and Field Medicine Practice, NavPers 10819-A; and Disaster Fatigue, NavMed P-5051. (NavMedSchool, NNMC, Bethesda, Md.)

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## Annual Meeting of the Aero Medical Association

The 28th annual meeting of the Aero Medical Association will convene at the Shirley Savoy Hotel, Denver, Col., during 6 - 8 May 1957. Presentations are scheduled by more than 175 scientists from the United States, Great Britain, Canada, Australia, and several European countries, whose topics will be of military significance based almost entirely on aeromedical subjects of specific interest to Armed Forces Medical Department officers, particularly those whose assigned duties or anticipated mobilization potential is related to naval aviation.

Eligible inactive Medical Department officers will receive one retirement point credit for each day's attendance, provided they register with the authorized military representative present.

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## AMA Annual Meeting in New York City

Eligible inactive Reserve Medical Corps officers of the Naval Reserve will receive retirement point credit for attendance at sessions of the Military Medicine Section, Scientific Assembly to be presented during the afternoons

of 4, 5, and 6 June 1957. Important details concerning the outstanding program to be presented are found on pages 16-17 this issue.

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## Fitness Reports for Inactive Reserve Officers Revised

BuPers Instruction 1611.9 provides for revision of the fitness report (NavPers-937) (Rev. 8-56) for Reserve officers on inactive duty and is effective for use in completing fitness reports due on, or after, 30 June 1957.

Some important changes concerning the "regular reporting senior" follow:

The Regular Reporting Senior is that officer or his successor to whom an officer has reported for duty pursuant to orders issued by competent authority. An officer detailed to command by competent authority is the regular reporting senior for all officers who have regularly reported to him regardless of respective dates of commission or listing in the Naval Register. The officers on whom period reports are required and their regular reporting seniors are indicated below:

| Officers Reported On | Regular Reporting Senior |
|---|---|
| Member or associate member of a pay or nonpay unit | Commanding Officer of unit |
| Commanding Officer of a Naval Reserve Unit | Commanding Officer next in chain of command |
| Officer in receipt of special inactive duty training (including appropriate duty and repeated periods of training duty)orders | ConRtc, CO of Unit, Naval District Commandant, CnaResTra as appropriate |
| Officer on staff or student at NROS | Director, NROS (If student is also member of pay or nonpay unit, the Director NROS should submit a concurrent report) |

This instruction also outlines important factors concerning the preparation and submission of the fitness report on each officer attached to the command. Accordingly, commanding officers of Naval Reserve Medical and Dental Companies are urged to familiarize themselves with the contents of this directive in order that the fitness reports of inactive Reserve Medical Department officers within their commands will be prepared and submitted properly to reflect a true evaluation of the individual reported on.

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## Dental Reserve News

Dental Officer Promotions. Seventy-six officers of the Dental Corps of the Naval Reserve have recently been selected for promotion to the grades of captain and commander by the Selection Board convened 19 February 1957.

New Reserve Dental Company. Naval Reserve Dental Company 1-2 was recently activated at Tufts University School of Dental Medicine in Boston, Mass. Rear Admiral Ralph W. Malone DC USN, Assistant Chief for Dentistry and Chief, Dental Division, Bureau of Medicine and Surgery; Captain Hector J. MacInnis DC USN, District Dental Officer, First Naval District; and Captain Collister M. Wheeler DC USN, Head, Dental Reserve Branch, Dental Division, Bureau of Medicine and Surgery, spoke briefly to the members of this company.

The Commanding Officer of this new company is LCDR Phillip Williams DCUSNRwho is also a member of the faculty. LCDR Williams stated that increased interest in the company was responsible for securing six additional members in two days following the activation.

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# SUBMARINE MEDICINE SECTION

## Diving Casualty Case Studies

Case No. 17

A small Japanese diving boat was working in India Basin of the Sasebo Harbor. Two divers were working in about fifty (50) feet of water while being supplied fresh air by one small air compressor. Each diver was being assisted by a diving tender. These divers use the method known as "blow up" to ascend to the surface. Tumitoshi's partner diver had signalled his tender that he wanted to come up. The air compressor used was of such small size, air to one diver had to be secured in order to bring the other to the surface by the "blow up" method. Unknown to either diving

tender, Tumitoshi had previously decided to ascend and at the time the tenders secured his air, Tumitoshi was part way to the surface. When Tumitoshi's air was secured he rapidly descended and due to a faulty non-return valve he suffered an extremely bad "squeeze". Frantically trying to overcome the effects of the "squeeze", Tumitoshi opened his air control valve and at the same time the tenders restored his air supply, since the other diver was now surfaced. Tumitoshi was unconscious by this time and came to the surface rapidly. The diving tenders located him floating on the surface and pulled him into the diving boat. His helmet was removed and bleeding was observed from the mouth, nose and ears. The diving tenders replaced his helmet and were preparing to lower him back into the water when the LUZON Diving Boat approached. LUZON Diving Boat personnel observed Tumitoshi's condition, requested and received permission to take him to the recompression chamber ashore. Upon arrival at the chamber it was necessary to connect the air supply from the LUZON Diving Boat to the chamber since the permanent air supply system had not yet been installed. When the chamber was ready Tumitoshi, still unconscious, was placed inside accompanied by the LUZON Medical Diving Technician, Paul J. HECKERT HM2, USN. HECKERT remained with Tumitoshi throughout the entire recompression time.

Additional medical aid was summoned and the USS AJAX (AR-6) Diving Boat called to act as a standby air supply in case of compressor failure. Because of Tumitoshi's unconscious state, his heavy bleeding, and that both air embolism and bends were probable the decision was made to treat him on Diver's Treatment Table Three, with no oxygen. Seventeen (17) minutes time elapsed from the time the request for assistance was made by the Japanese until Tumitoshi was started down in the chamber. At ten (10) feet, going down, Tumitoshi regained consciousness but not until at about thirty (30) feet was he coherent enough to converse with a Japanese interpreter. He complained of a bad pain in the chest, sore throat and ears, and said that he could not see. At one hundred sixty-five (165) feet he felt much better and was brought up on Diver's Treatment Table Three. Tumitoshi was asked to walk several times during treatment and seemed to be recovering. A medical officer arrived when Tumitoshi was at one hundred forty (140) feet, coming up, and stood by to assist and advise. Upon leaving the twenty (20) feet level and going to the ten (10) stop Tumitoshi's vision returned to normal.

Tumitoshi entered the recompression chamber at 1115 and was surfaced at 0636 the next day after a total chamber time of nineteen (19) hours and twenty-one (21) minutes. Upon reaching the surface he was kept near the chamber for fifteen (15) minutes, to observe his reaction, and then was removed to the Sasebo Hospital. He continued to improve in the hospital and it has been reported that he should be normal in a short time. A

medical diagnosis could not be obtained from the Japanese hospital but medical opinion is that he probably had both the bends and a slight air embolism. The imprint of the breastplate was clearly visible on Tumitoshi's shoulders and chest, his eyes protruded and swelling of the face and neck was prevalent.

On 13 February 1957, Mrs. H. Nozoe, President of the Saibu Busan Company, Sasebo, Japan, visited the Commanding Officer, LUZON, and expressed her appreciation for the rescue and treatment of Tumitoshi. Mrs. Nozoe was instructed and informed in the use of LUZON diving equipment as an aid in the possible prevention of future accidents. News coverage of this incident was made by the Stars and Stripes and Mainichi newspapers and appeared in the 13 February 1957 editions of those newspapers.

Comment: This case demonstrates a number of basic principles of safe diving practice. In the absence of detailed information certain points must be dealt with by conjecture.

Failure of communications: The basic system of communications is by hand signals on the air hose and life line between diver and tender. Other systems are auxiliary or supplementary. In this instance the diver who became the casualty started to the surface without signalling his tender. Additionally, the tender cut off the air without signalling the diver. Had the fundamental practice of exchanging signals before making a change in status been observed this casualty could not have occurred, since both the tender and the diver would have known they were in a dangerous situation (Diving Manual, Art. 581 and 582).

Blow-up as a means of ascent is a dangerous practice not tolerated in properly supervised diving. Blow-up occurred here when the suit became over-inflated and the added buoyancy brought the diver to the surface. This was done deliberately. Admittedly this practice is used by civilian divers not infrequently. They seldom work at great depths and, since familiarity breeds contempt, they become careless about diving finesse. The Diving Manual (Art. 965) lists the following dangers associated with blow-up: air embolism resulting from holding the breath during the ascent, decompression illness from too rapid decompression, mechanical injury from striking objects during the ascent, squeeze from falling back when air is exhausted from the suit after reaching the surface. To this list may be added drowning which may result when excessive pressure ruptures the suit. This allows air to escape and the heavy helmet and breastplate holds the diver's head under water. Normally the bubble of air in the helmet and upper part of his suit provide positive buoyancy and the shoes and belt provide negative buoyancy so the diver is in an upright position

Size of Compressor: Diving two divers off such a small compressor is a dangerous practice. (Diving Manual Art. 633, 642, 643). No auxiliary air source to cover cases of compressor failure are mentioned.

Faulty nonreturn valve: This valve is provided for the purpose of preventing the loss of air in the suit if for any reason the air supply is interrupted. Diving Manual Article 553(2) has this to say "It can readily be seen that the proper function of the safety (nonreturn) valve is most important, and it must always be carefully tested before a diver is permitted to descend." It then goes on to describe the procedure for testing this valve. The article concludes with, "If these precautions are carefully observed, the safety valve can be absolutely depended upon in an emergency; if neglected, the safety valve may fail at a critical time with disastrous results."

In this case the combination of faulty diving practice resulted in first subjecting the diver to squeeze and then to blow-up the second time. Obviously he was in a bad way. The plan to place him back in the water for treatment was sound except that 50 feet of water does not provide adequate treatment depth. However, it would have been better than nothing. (Diving Manual, Art. 965 (4)).

The recognition of the seriousness of the situation and the prompt speedy action taken by LUZON personnel speaks well for their knowledge and training. Calling for AJAX diving boat to stand by was a mark of clear-headed thinking and good diving practice.

"What happended to this diver?" one may well ask. Civilian divers are noted for laxity in recording depth and duration of dives. Since they usually work at shallow depths, they often do so without encountering difficulties. The best information in this case is that the diver was at 50 feet for approximately two hours, surfaced for 20 minutes and descended again to that depth for about ten minutes before starting to the surface. About 30 minutes elapsed between his second surfacing and starting recompression in the chamber. Navy Standard Decompression Table for air dives to 50 feet for two hours require two minutes decompression at 10 feet. This diver had no such decompression. Current practice would have indicated decompression for a dive of 130 minutes following the second dive. He had none. He may well have had decompression illness.

It is impossible to state whether he did, or did not, have air embolism. Since he was surfacing himself by his usual method on his first blowup we may speculate that he did not hold his breath. Since he was unconscious on the second blowup we may speculate he could not have held his breath. Air embolism is a possible but improbable diagnosis in this case.

Squeeze is the condition when the external pressure on the suit exceeds the internal pressure. In this instance the bubble of air in the helmet and upper part of the suit is compressed and the tissues of the body are forced to fill the volume vacated by the air as it was compressed. The result is to force the shoulders against the breastplate and up into the helmet. Tissue fluids are squeezed up into the tissues above the level of the plug formed by the shoulders and chest. Hemorrhage occurs when the blood

vessels rupture. Bones may be broken. Obviously this is a dangerous situation. This diver regained consciousness when recompressed to a pressure equivalent to 10 feet of depth. He began to cough up blood and mucus. Both eyes were black (intraorbital hemorrhage), nose and lips discolored (hematomae). He was sore over the chest, shoulders and on up to the eyes. Vision was blurred (possible intraocular hemorrhage or bubble). Ears felt blocked (hemorrhagic otitis media). Chest felt tight but no pain when breathing. When he lay on his back he had a slight rasp in his breathing. He was most comfortable on the left side (mediastinal emphysema or hematoma?) Face swollen, throat sore, speech good and fluent. Talking irritated throat. Motion intact in all extremities. Able to urinate. Lt. Richard H. Mabe, MC, USN, of the Sasebo Naval Infirmary, called to the scene after treatment was started, paid tribute to HM2 Paul J. Heckert, diver hospital corpsman from LUZON as follows:

> Heckert recognized the seriousness of the condition, got him into the recompression chamber right away and he's staying with him for a long cold 18 hours.

There are a number of stations where considerable diving activity is conducted and where facilities for treatment of diving casualties are available. Any medical officers interested in taking the eight weeks course in diving medicine and assignment to such a billet are invited to write Director, Submarine Medicine Division, Bureau of Medicine and Surgery, Washington 25, D. C.

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## Policy

The U. S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the existence and source of such information. The items are neither intended to be nor are they susceptible as a substitute for any item or article in its original form. All readers are urged to obtain the original of items of particular interest to the individual.

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The printing of this publication has been approved by the Director of the Bureau of the Budget, 16 May 1955.

## AVIATION MEDICINE SECTION

### Note to All Flight Surgeons

It is recommended that all activities having ejection seat trainers place an added item in the pre-ejection procedure. This item is that goggles or eyeshields in the NPH-5 Helmet be placed in the full down position prior to firing the seat. This will avoid any tendency for flexion of the neck and in actual use will give maximum protection to the face from airblast.

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### Inadequate Diet

Recently, the following report was made by a flight surgeon about conditions in his Marine air squadron.

> Let's not go overboard on reducing--it does require medical supervision. Furthermore, in view of two recent Aircraft Accident Reports which stated that the causative factors were due to faulty eating habits, we believe that the following statements are apropos (especially to "coffee-only-for-breakfast" officers).
>
> It has been proved conclusively that "non-feeding," or irregular eating practices over an extended period contributes to fatigue, human error, and possible aircraft accidents. The human body should be "refueled" just as regularly as the aircraft you are flying.
>
> Visual and psychomotor tests in humans suggest that the ingestion of glucose (sugar) improves performance at altitude. On the other hand, there is evidence that a low blood sugar interferes with oxygenation of the central nervous system so that a mild lack of oxygen may produce symptoms which would not occur with normal blood sugar.
>
> We recently requested that a group of aviators report to sick bay immediately upon coming to work, being careful that no prior warning be given to them as to our intentions. This, in order not to interfere with their normal breakfast habits. Blood was withdrawn and blood sugar determinations made with the following rather startling results:

| | |
|---|---|
| 176 mgm/100cc | 96 mgm/100cc |
| 158 mgm/100cc | 96 mgm/100cc |
| 120 mgm/100cc | 92 mgm/100cc |
| 117 mgm/100cc | 77 mgm/100cc |
| 108 mgm/100cc | 71 mgm/100cc |
| 100 mgm/100cc | 68 mgm/100cc |

64 mgm/100cc

Any blood sugar determination below 80 mgm/100cc is considered to be low. Symptoms of a low blood sugar may range from sweating, flushing, pallor, numbness, chilliness, hunger, trembling, headache, dizziness, weakness, apprehension, or fainting, depending upon how low a level may be reached.

From the above results, we can conclude that nine aviators had adequate breakfasts prior to the start of their working day and probable flights. The remaining four--well, draw your own conclusions! The fact remains that an empty stomach is not conducive to good flying.

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## Use of Antihistamines

At this time of the year, a lot of people get hay fever and use antihistamine drugs to combat it. These drugs are also used for other illnesses due to allergy. Several of them are used to prevent air sickness. Pilots who have antihistamines prescribed for them should consider possible side effects which may vary with individuals and with different drugs.

According to the current regulations, you may not act as a crew member if your capacity to act as a crew member is impaired by any ". . . narcotic or stimulant."

By the way, antihistamines will not cure or prevent colds!

The following drugs are readily available antihistamines:

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| Andramine | Dramamine |
| Anthisan | Marzine |
| Benadryl | Perazil |
| Bonamine | Phenergan |
| Chlor-Trimeton | Antihist |

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## Aviation Psychology

A recent communication from Dr. J. L. Brown, Head of the Aviation Psychology Research Program at the Aviation Medical Acceleration Laboratory at Johnsville, Pa., gives a general picture of the nature of the psychological research being developed at that activity. The pertinent part of Dr. Brown's letter follows:

> In the area of vision, we have just completed a study in which the nature of rod and cone involvement was investigated in terms of luminance threshold for the resolution of visual acuity test objects. We are presently conducting research on the effects of high altitude, or reduced partial pressure of oxygen, on the ERG and on visual acuity thresholds.
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> One of our staff is planning an experiment on the relation between visual acuity and contrast. Another member of our staff is planning research on some theoretical problems which arise in connection with results obtained when multiple flashes of light are presented within critical duration. We have obtained electronic driving equipment which will permit the presentation of series of flashes from a few microseconds duration up to as long as a second or more.
>
> We have recently obtained a new laboratory for animal studies. The work which we plan to do initially will employ instrumental conditioning techniques, probably simple bar pressing for the most part, in the investigation of effects of reduced oxygen, acceleration, and other stressing agents. Instrumentation for this work has just been completed.
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> Another series of experiments is underway in which we are investigating the effects of angular acceleration in terms of nystagmus and the oculogyral illusion. The accurate control which can be achieved with the human centrifuge renders it an excellent device with which to investigate the relevant characteristics of stimulation of the vestibular mechanism.
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> In the field of human performance there are many applied aviation problems which require investigation. Designers are continually trying to reduce the weight and complexity of electronic equipment which is employed in tracking and control systems. Reduction of electronic complexity usually results in increased complexity of the human pilot's task. It is desirable to determine whether or not the more complex tasks can be performed efficiently before investing extensively in the development of proposed simplified electronics systems. Short of testing in an aircraft, we believe that the human centrifuge will afford the most realistic possible conditions of stimulation. With the aid of analog computing equipment, it will be possible to take into account wind velocity, relative direction of the force of gravity, and other variables. I am certain that the use of computers is going to become of ever increasing importance in psychological research. This equipment will enable us

to do a number of fundamental experiments in addition to the applied ones.

The Aviation Psychology Laboratory at the U. S. Naval School of Aviation Medicine at Pensacola continues to carry on research in many areas. The following paraphrased excerpts from some of the recent reports from this activity will prove to be of particular interest to flight surgeons:

One investigation evaluated the four tests of the revised aviation selection battery. The Aviation Qualification Test was found to predict ground school grades to a highly acceptable degree. The Spatial Apperception Test, the Mechanical Comprehension Test, and the Biographical Inventory each correlated significantly with the attrition criteria for the 1109 cadet subjects. The revised FAR score correlated higher with attrition criteria than did the previous FAR score which it replaced.

Difficulty in learning approaches, landings, and cross-wind technique has been shown by a recent investigation to be among the leading contributing factors to failure in naval primary flight training. At the University of Illinois evaluation of a contact approach trainer developed for use with the 1-CA-2 Cycloramic Link Trainer, and implemented with a so-called "principles training" program, indicated that subjects who learned to make approaches in the trainer before attempting actual approaches in the airplane were superior to a control group on approaches and landings. The training effectiveness of the trainer was evaluated at Pensacola under routine training conditions within the frame work of navy primary flight training. Results indicated that the group receiving instruction in the trainer received significantly higher ratings on approaches, fewer practice landings during pre-solo stage, and fewer unsatisfactory check flights than did the control group.

The purpose of another investigation was to determine if a relationship existed between the behavior of cadets in a miniature stress situation early in pre-flight training and manifest fear in later flight training. The rationale underlying this problem was the possibility that fear exhibited under conditions of simulated danger might be related to the development of more generalized anxiety when exposure to danger is more frequent and prolonged.

The miniature stress situation used in this study was a simulated high altitude flight in a decompression chamber given to all cadets during pre-flight. Fifteen hundred and forty cadets were used in this research. Records were kept of the individuals who replaced their oxygen masks before the end of the customary ten minute period at 20,000 feet and those

who reported an "ear block" on descent. These two actions were considered indices of an anxiety reaction. Manifest fear in later flight training was determined by an analysis of the exit interviews of attrition cases.

Fifty-two per cent of the cadets who expressed anxiety toward flying when leaving the program also had demonstrated anxiety reactions during the decompression chamber training. Only 31 per cent of the cadets who successfully completed flight training demonstrated such reactions. The difference between these two groups was statistically significant. These results suggested that it may be possible to develop measures which will serve as secondary screening devices or as criteria for tests of "stress tolerances."

Another report reviewed recent research findings to find an answer to the question:

"Can aircraft accidents be predicted from measures taken on pilots?"

This paper raised the question of selecting and eliminating the individuals who are going to have accidents. The studies reviewed clearly indicate that any increase in such selection is not possible on the basis of existent aptitude or performance measures nor on the basis of aircraft accident histories. These findings would suggest that the present procedures of selection and training are effectively performing this job. No additional selection aimed at accident reduction is possible with these types of measures.

It was noted that attempts to predict aircraft accidents from more transitory individual variables such as moods, inattentiveness, temporary physiological states, or changing levels of training had not been explored thoroughly enough to reject their potentialities as determinants of aircraft accidents.

It was concluded that a portion of the "pilot error accidents" would remain unpredictable. These "would be" accidents result from conditions imposed on the individual and to which he could not respond adequately. These accidents would be unpredictable from individual measures in that all individuals would be equally incapable of adequate responsivity and hence no measurable differences among individuals would obtain. A further portion of these types of accidents would be due to inadequate responses related to the individual pilot's "state of readiness" to respond. These states of readiness would be transitory and related to moods, physiological states, conditions of attention, or levels of training. If this reasonably describes the "pilot error situation," the pertinent problem of this area is the determination of the extent to which these individual states of readiness enter into accident production and to what extent such states are predictable.

The Aviation Experimental Psychology Branch of the Bureau has recently completed a check on the effectiveness of the recently revised aviation selection test battery. Results are shown in the following diagram:

THE EFFECTIVENESS OF THE NAVY FLIGHT APTITUDE RATING BATTERY FOR PREDICTING THE GROUND FAILURE, FLIGHT FAILURE, AND VOLUNTARY ATTRITION OF NAVAL AVIATION CADETS

FAR Grades

| | | |
|---|---|---|
| 8,9 | 1087 NAVCADS NEEDED TO PRODUCE 1000 AVIATORS (92% of 1087) | 87 Failures (8% of 1087) |
| 7 | 1099 NAVCADS NEEDED TO PRODUCE 1000 AVIATORS (91% of 1099) | 99 Failures (9% of 1099) |
| 6 | 1176 NAVCADS NEEDED TO PRODUCE 1000 AVIATORS (85% of 1176) | 176 Failures (15% of 1176) |
| 5 | 1205 NAVCADS NEEDED TO PRODUCE 1000 AVIATORS (83% of 1205) | 205 Failures (17% of 1205) |
| 4 | 1351 NAVCADS NEEDED TO PRODUCE 1000 AVIATORS (74% of 1351) | 351 Failures (26% of 1351) |
| 3 | 1493 NAVCADS NEEDED TO PRODUCE 1000 AVIATORS (67% of 1493) | 493 Failures (33% of 1493) |

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If entrance standards were lowered to permit acceptance of these applicants 3500 NAVCADS would be required.

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|---|---|---|
| 1.2 | 3500 NAVCADS WOULD BE REQUIRED 1000 AVIATORS (40% of 3500) | 2500 Failures (60% of 3500) (War Experience) |

Recent estimates indicate that the psychological selection test program is currently saving the Navy over eight million dollars per year.

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## High Altitude Escape Studies

On 21 November 1956, a series of 21 dummy and 20 live tests of a Wright Air Development Center experimental multistage personnel parachute were completed at the U. S. Naval Auxiliary Air Station, El Centro, Calif. The multistage parachute consists of a six-foot stabilization parachute which is deployed by a static line upon exit from the aircraft, and a 30 foot (C-11) parachute which is deployed by a pilot parachute when automatic cut-away of the first-stage parachute opens the second-stage parachute pack.

The moderately severe spinning during the early dummy drops (up to a maximum of 107 RPM) was corrected by raising the suspension point for the first-stage parachute risers which permitted the dummy to hang more nearly in a vertical position and thus reduced the effective area on which aerodynamic forces could work to induce spinning.

During the live tests--up to 23,000 feet with a delay of 120 seconds until first-stage cut-away and main parachute deployment, the very minor rotations present (generally to the right, one complete revolution in approximately 10 seconds) could be stopped and reversed by extending or retracting one foot at a time. All jumpers participating, four from WADC and five from the 6511th Parachute Test Group, El Centro, stated they could observe their stop watches and altimeters without any difficulty, at all times.

There was no apparent difference in the magnitude (minimal) of the opening shock of the first-stage parachute as the jump altitude was raised from 12,000 to 15,000, 20,000, and 23,000 feet. All live jumps were made from a C-119G type aircraft flying at 110K IAS, and with "clam-shell" doors removed. (Aero Med. Lab., Wright Air Dev. Ctr., Activity Report of 17 Dec 1956)

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## The Effect of Eating Upon Fluid Intake at Simulated Altitude

Studies have shown that feeding greatly increases the total amount of fluids consumed at altitude. Fifteen subjects participated in two duplicate 12 hour chamber studies at a simulated altitude of 10,000 feet. In one set of trials, food was served; in both, the subjects were allowed water freely. Subjects consumed an average of one quart more liquid when food was served. One-third of this additional quart of liquid was water. The remainder consisted of milk and fruit juices served with the meal. When the water of metabolism and the moisture content of the food eaten are included, the increase is even greater. Since an increase in fluid intake will aid in maintaining an adequate state of body hydration, feeding is an important consideration in the water balance picture. (Aero Med. Lab., Wright Air Dev. Ctr., Activity Report of 4 Mar 1957)

## Navy Installation of Liquid Oxygen

A trip was made to North American Aviation, Columbus, Ohio, to check capacitance gaging systems and evaporating equipment separate from the oxygen converter. The North American liquid oxygen system is an easily accessible package unit in that all oxygen equipment is located together in the aircraft except for the supply line. Also North American is working in the direction of portability of equipment and the quick-change feature. In other words, converters can be filled either on the aircraft or off, and the entire liquid oxygen system can be quickly removed from the aircraft.

North American is specifying evaporator plates to warm oxygen to near ambient temperatures. These plates are essentially two metal plates attached together with a specified flow path between them. It is claimed that an evaporator plate of 6 in. by 12 in. approximate dimensions will replace about 20 ft. of 5/16 in. tubing in warming oxygen to near ambient temperatures at a flow of 20 liters per minute.

One factor which simplifies North American problems with respect to liquid oxygen systems is that only one five-liter converter is required per aircraft at the present time. North American demonstrated complete interchangeability between gages and probes of different manufacturers. (Aero Med. Lab., Wright Air Dev. Ctr., Activity Report of 17 Sep 1956)

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## Human Performance in High Energy Noise Fields

The Aero Medical Laboratory is concerned with changes in human performance in high energy noise fields. An experiment has been conducted showing that keeping watch for 2 hour periods is done about as well in noise as in quiet until the final half hour of work when performance is significantly poorer in noise. Experimental subjects were required to monitor three single stepping clocks and to respond when one of the clocks moved through a double step. The comparison was between performance of a group of subjects on this task for one-half hour of quiet followed by one and one-half hours of noise and performance by the same group for two hours in quiet. These two conditions result in significantly different performance levels in favor of the quiet condition during the final half-hour only. The noise produced electronically was equivalent to that experienced by a crew chief sitting without head gear and with canopy up in an F-86 being run up on the ground. It is of some interest to note that overall performance on the monitoring task averaged no more than about 50% of the signals responded to correctly. During the last half hour in noise, this level dropped to about 25% correct.

The results indicate that monitoring efficiency is unimpaired by noise for about one hour, but attempts to continue to monitor in a relatively noisy area after that time period result in poorer performance. Further research is planned to determine whether the time period for efficient monitoring on this task is absolute or is related to the total work period. (Aero Med. Lab., Wright Air Dev. Ctr., Activity Report of 9 Jan 1956)

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